Residential Recessed Downlights Update

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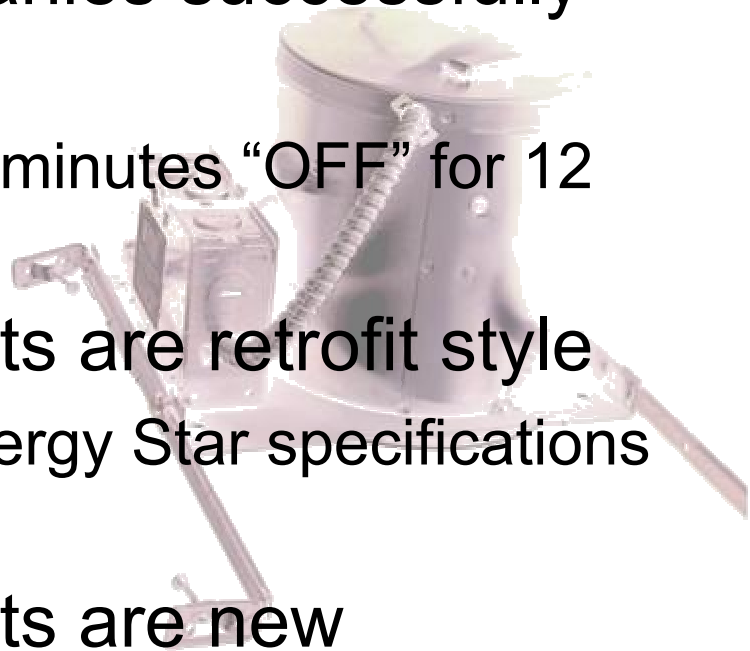
Energy Star® Lighting Partners Meeting

April 28, 2004

Project Status

- 6 products from 3 companies successfully completed lab testing
  - Cycling 3 hours “ON”, 20 minutes “OFF” for 12 months
- 4 of 6 successful products are retrofit style
  - EPA draft revisions to Energy Star specifications will allow retrofit style
- 2 of 6 successful products are new construction style
  - Priced high relative to incandescent downlights



Starting Phase III Because:

- More innovation in product category needed
- Range of successful products from Phase II is small; primarily retrofit style
- Interest is still high
  - Proposed 2005 CA Title 24 will require “high efficacy ICAT downlights
- Believe more extensive technical assistance in product development will yield more innovation

Phase III Plans

- Continue supporting Phase II products
- Competitive solicitation for manufacturers to partner with PNNL (June, 2004)
- Bidders compete for access to technical assistance, association with DOE program, and promotional assistance
- Winning bidders receive technical assistance
  - Provide technical assistance package, with design concepts and associated test results
  - Consulting, testing

Phase III Plans (cont.)

- Partners develop prototype fixtures
- Evaluation panel (experts, buyers, builders) reviews prototypes; approves for final testing
- Promotion of successful products in cooperation with partners (Spring 2005)

Experiments to Support Phase III Completed

- Better understand thermal characteristics of airtight recessed cans operating in insulated ceilings
- Using infrared imaging
- Proof of concept testing for thermal modifications

Analytical Method

- Performed experiments on various combinations of design features in a simulated insulated ceiling apparatus:
  - Baseplate size and material
  - Ballast location and thermal coupling
  - Cylinder thermal isolation
- Used factorial analysis to estimate interactive effects among design features

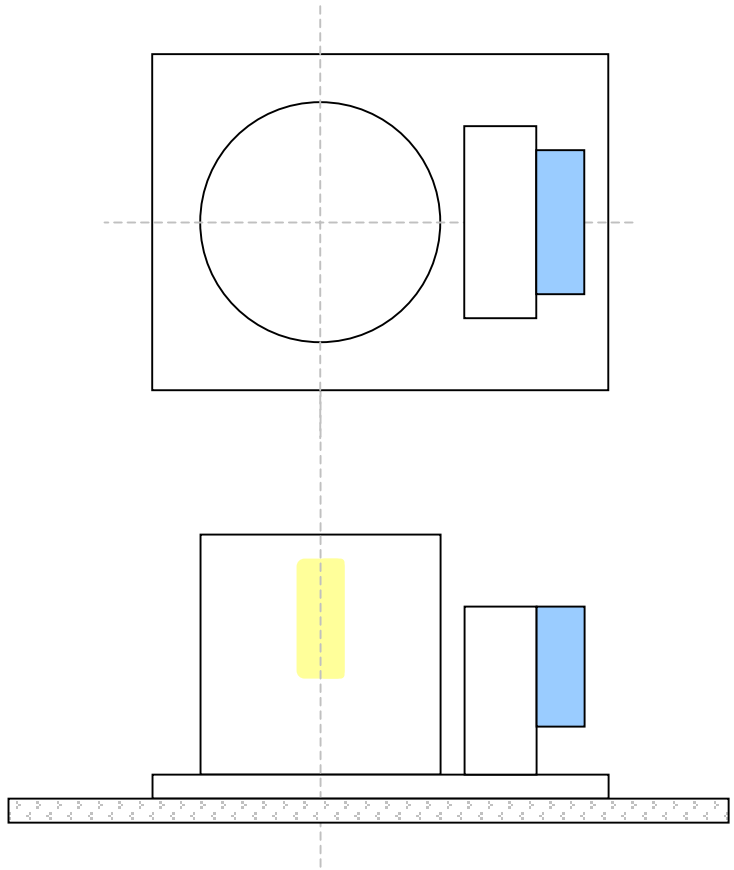
Test Apparatus

- 24" x 24" x 30" plywood box
- 12" loose fill cellulose insulation ~ R-45
- Similar to UL test apparatus
- Datalogger with 25 thermocouple channel capability

Photo of R-can in PNNL testing apparatus

Baseline Recessed Can

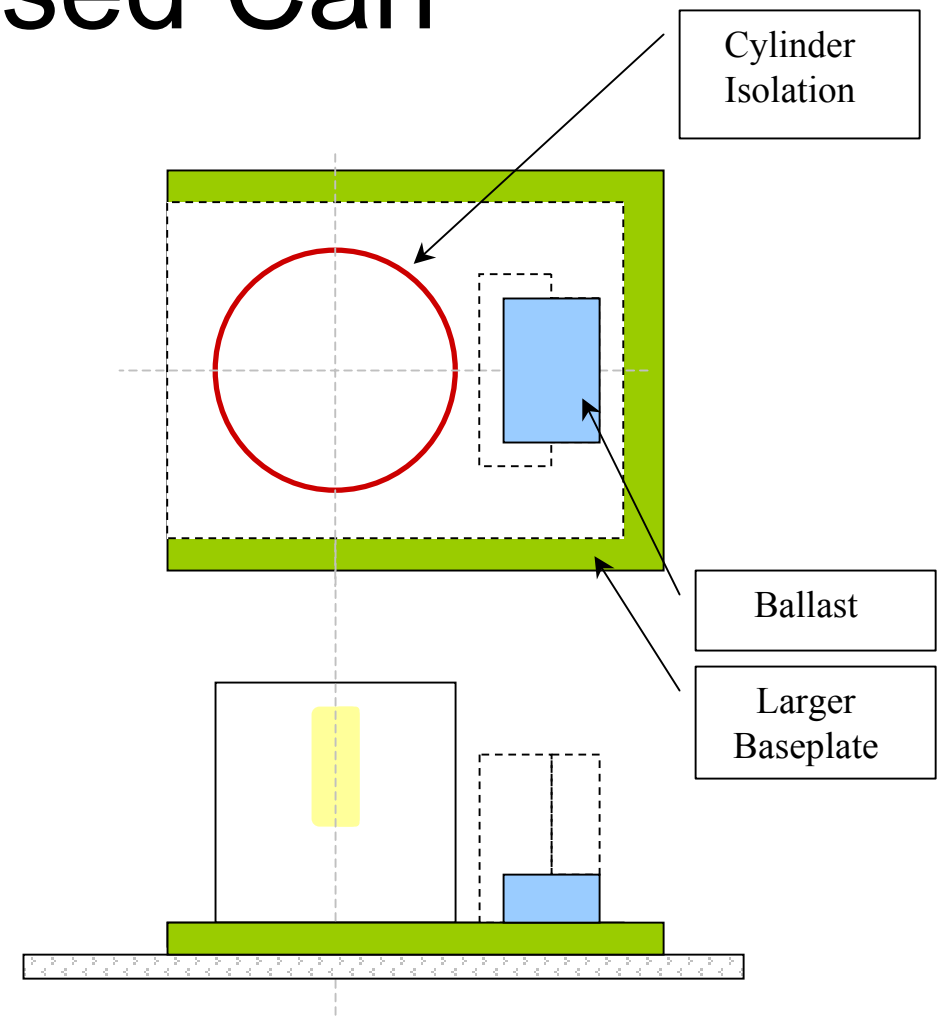
- 26-watt CFL (yellow)
- Ballast mounted on the side of the junction box (blue)



Not to scale

Modified Recessed Can

- Ballast mounted on baseplate (blue)
- Larger baseplate (green)
- Cylinder thermally isolated from the baseplate (red)



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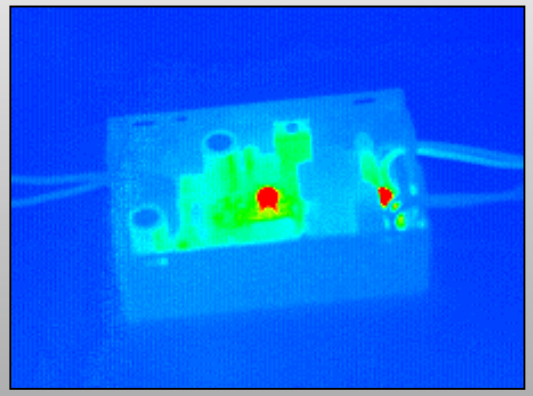
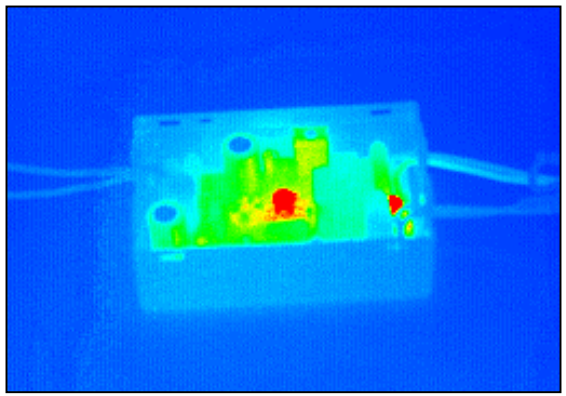
Preliminary Infrared Photos



Temperature Range:
22.0-48.0°C

Inside of ballast

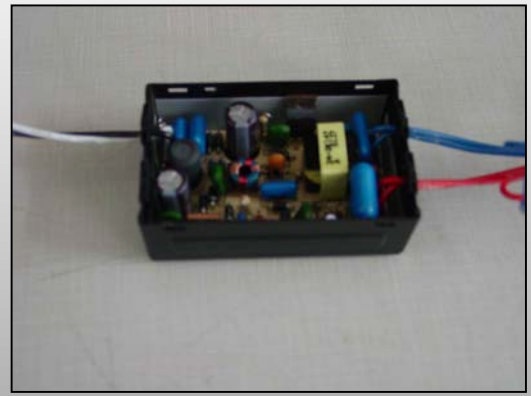
~ 1 min. after startup



Temperature Range:
22.0-48.0°C

Inside of ballast

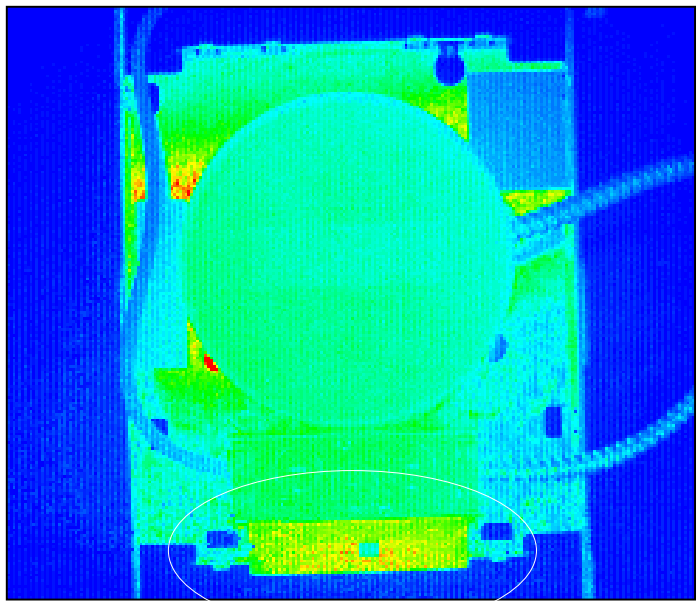
~ 8 min. after startup



Temperature Range:
NA

Inside of ballast

Preliminary Infrared Photos



Temperature Range: 23.0-33.0°C

~ 20 min. after startup

Ballast is shown in white circle

Temperature Range: NA

Ballast is shown in white circle